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REPORT
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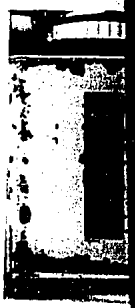

COUNTRY	Poland	DATE OF INFORMATION	1951
SUBJECT	Economic - Chemicals		
HOW PUBLISHED	Monthly periodical	DATE DIST.	26 Dec 1951
WHERE PUBLISHED	Warsaw	NO. OF PAGES	4
DATE PUBLISHED	Mar 1951		
LANGUAGE	Polish	SUPPLEMENT TO REPORT NO.	

THIS IS UNEVALUATED INFORMATION

SOURCE Przemysl Chemiczny, Vol VII, No 3, 1951.

IMPROVING POLISH PROCESSING METHODS IN SULFURIC ACID INDUSTRY

METHODS OF IMPROVING SULFURIC ACID INDUSTRY

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In the USSR, production of sulfuric acid is based on sulfur ores and metallic ores, particularly pyrites. The USSR has given up the chamber process, and in its place has developed to a high degree the tower method /high-efficiency chamber method, in which chambers are replaced by packed columns or towers/. Extraordinary results have been attained from this process, 200 kilograms of 100-percent sulfuric acid being produced per cubic meter of lead-enclosed volume. A method has been developed to obtain 92 and 96 percent oleum directly from the tower installations. Knowledge concerning the phenomena occurring during the nitrogen oxides process has been increased and, although all the problems connected with this process have not been theoretically solved, at least considerable understanding of the process and of the mathematical concepts connected with it has been achieved. The results of these investigations, both theoretical and practical, have been published, and the work of Malin and his co-workers is the most complete work to date on sulfuric acid. Older works, such as those of Lunge and Waeser, and the more recent of Fairlie, as well as the French texts have been outdated.

Until the end of World War II the sulfuric acid industry in Germany, as in the USSR and Poland, was based on sulfide ores. Because of the shortage of these ores in Germany efforts were made to find other sources of sulfur, especially from gypsum, combining sulfuric acid production with that of cement.

The technology of the prewar Polish sulfuric acid industry was on a very low level. The factories producing sulfuric acid were mostly branches of larger chemical works, and for this reason were neglected and technically backward. Therefore, the Three-Year Plan, had to be devoted to activating and rebuilding existing installations.

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The conditions under which the sulfuric acid industry has to work in Poland are similar to those in the USSR. It is therefore possible and desirable for the Polish industry to profit from the experience of Soviet industry.

The Six-Year Plan envisions a considerable expansion of the chemical industry. The help of the USSR in fulfilling that plan is extremely important, and without this help the plan will not be fulfilled.

The industry can be expanded only if all the workers and technicians cooperate fully and if the work is well organized. The mobilization of all the workers of this industry is a fundamental condition for the fulfillment of the Six-Year Plan in the sulfuric acid industry.

First, it is necessary to improve the technical knowledge of all workers using various types of equipment in the sulfuric acid industry. Work connected with furnaces, towers, chambers, pumps, and electrical equipment, where equipment is exposed to corrosion or high temperatures, requires constant care. There are no truly acid-resistant materials, so that all equipment eventually wears out and has to be replaced. Only constant care can keep installations in operation. It must also be remembered that Polish conveyor facilities are still, for the most part, antiquated, and require constant physical effort, since the flow of raw materials must not be stopped for even a short while.

New work techniques introduced in the new sulfuric acid plants, together with the efforts of the workers operating the equipment, will raise the technical level of production greatly. The cooperation of the technical and managerial workers has first importance in this field. Their task will be to raise the operation of the sulfuric acid plants to a higher level of technology by instructing the workers. There must be no worker in any factory who does not know how to operate the equipment and who does not know the over-all setup of the operation. Only a worker with this training can be a really conscientious manager of the equipment, and not a machine himself.

In addition, the technicians of the sulfuric acid industry have a number of problems to solve both theoretical and practical, during the Six-Year Plan, which will be decisive to the success of this industry. Theoretical knowledge of the oxidation process must be mastered with the application of new methods of research on chemical kinetics.

An understanding of the chemical, thermodynamic, and hydrodynamic processes occurring in the tower process and the ability to make calculations of these processes is only the beginning. The determination of the theoretical conditions necessary to achieve a yield of 300 to 400 cubic meters of 100-percent sulfuric acid per tower per 24 hours, as has been done on an industrial scale in the USSR, requires theoretical as well as practical work in factories as well as in laboratories. The problems of the removal of nitrogen oxides and of absorption of sulfur trioxide by sulfuric acid at higher concentrations of oleum are questions that must be solved if the industry is to succeed and progress.

An increase in the quantity of pyrites containing 45-percent sulfur handled per furnace to a level of 150 to 300 kilograms per 24 hours requires the solution of several theoretical and construction problems, and a careful analysis of the roasting process. The problem of introducing the use of suspension furnaces for roasting pyrites will require not only construction work but also theoretical research.

The problem of the conveyance of pyrites and roasted ores, which is so important and so complicated, must be analyzed and solved by the highest qualified authorities after a thorough study in the factories.

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A very difficult problem, and one which has not been touched in Polish technical literature, is that of ceramic materials resistant to sulfuric acid and various other compounds encountered in sulfuric acid production.

Pumps are the source of numerous difficulties in sulfuric acid plants. Not only the choice of materials, but also the design of these machines must be adapted to the needs of sulfuric acid production. These problems cannot be solved by industrialists alone, but must also have the cooperation of specialists and theoreticians. In this matter, the cooperation of the factory personnel with that of the pump design offices is vital. This problem must be considered as one of the fundamental ones for the sulfuric acid Six-Year Plan.

Another important problem is the development of a rational type of cooler for sulfuric acid for use with various apparatus. In this field the efficiency experts of the individual factory installations will have to play an important role.

A gigantic task lies in the replacement of lead in sulfuric acid plants by cast iron. This substitution, which has been made in the USSR, must also be made in the Polish sulfuric acid industry. This will require enormous efforts and caution in accustoming the factory personnel to the new methods. Considerable engineering design and construction work will also be required to adapt the existing equipment to the new technology. The change from lead to steel in the tower process will bring about a fundamental change in the process itself. Another step will be the complete removal of chambers for acid production and their scrapping or alteration into towers. This will do away with the oldest type of equipment for sulfuric acid production.

The result of all these changes will be the appearance of a completely new sulfuric acid industry in no way resembling the industry of the period preceding World War II. The key problem in this connection is that of producing sulfuric acid and cement from gypsum and anhydrite. This will require further efforts on the part of scientists and technicians.

Of all the problems faced by the sulfuric acid industry this is the most important and most difficult one, since it is crucial to Polish self-sufficiency in sulfur raw materials in the future. It will require full mobilization of all possible resources. In addition, there are other problems involved in producing special equipment for sulfuric acid factories, including the construction of wet electrofilters.

All of the problems mentioned will require the cooperation of theoretical and practical personnel. These latter must first of all collect methodical observations using precise measurements. Measurements in sulfuric acid plants must be on a high level with respect to both equipment and methods. If the control measurements are not modernized and if there is not thorough control of processes within the equipment, all planning and efforts will not produce results.

The attainments and experiences of Polish sulfuric acid factories must be exchanged and published. Rationalization and work competition will make these attainments possible. Workers' innovations, particularly in the matter of equipment which is constantly exposed to the danger of corrosion, may produce considerable successes. The problem of gaskets, of equipment for conducting acid, and of repairs made during operations are all part of the work of rationalizers. Attention must be devoted to achieving high yields per unit of equipment, since this is dependent on the care which equipment receives and on maintaining optimal conditions of operation.

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The following three points must be considered absolutely essential:

1. The expansion and modernization of the sulfuric acid industry as the key problem of the Six-Year Plan.

2. All available resources of the sulfuric acid industry must be mobilized toward the solution of the problems facing the industry.

3. Other branches of industry and scientific institutes and engineering offices must recognize the urgency of sulfuric acid production problems and must give first priority to their solution.

MAIN INSTITUTE OF METALLURGY STARTS PRODUCTION OF ROTAMETERS

The rotameter is the simplest type of flowmeter used in the control of sulfuric acid production. The GIM (Glowny Instytut Metalurgii, Main Institute of Metallurgy) has begun the production of rotameters and is the sole producer in Poland.

In view of the wide application of rotameters for various measurements, Polish industry should give first priority to serial production of indicator rotameters, followed by recording rotameters and total flow recorders.

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